

Family dysfunction and Adolescents' anxiety and depression: A multiple mediation model

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ARTICLE INFO

Keywords:

Family dysfunction
Anxiety
Depression
Self-esteem
Loneliness
Adolescents

ABSTRACT

Based on a social-cognitive model, we examined the multiple mediating roles of self-esteem and loneliness in linking family dysfunction to anxiety and depression in adolescents. Participants at baseline included 921 junior high school students ($M_{age} = 12.98$ years; 51.7% girls) from a mid-sized city located in Northern China. The students completed a multi-measure questionnaire at three time points, six months apart, starting from the initial grade of junior high school (Grade 7). Using structural equation modeling, we found that: High levels of family dysfunction at Time 1 were significantly related to increases in anxiety and depression at Time 3; both self-esteem and loneliness at Time 2 mediated the relations between family dysfunction at Time 1 and anxiety and depression at Time 3. These results suggest the importance of multisystemic efforts (i.e., addressing social context and intrapersonal cognitive factors simultaneously) to prevent or reduce adolescents' anxiety and depression.

Introduction

Anxiety and depressive disorders are among the most common forms of psychopathology in adolescence (Inchley, Kirby, & Currie, 2011). These disorders represent typical responses to the internal and external pressures corresponding to the unique physical and psychological changes associated with adolescence, including the development of greater self-awareness (Rasing, Creemers, Janssens, & Scholte, 2017). The specific prevalence rates of anxiety and depressive disorders are 38% and 18% respectively, among people of ages 13–17 in America (Kessler, Petukhova, Sampson, Zaslavsky, & Wittchen, 2012). Among adolescents in non-Western countries, such as China, the prevalence of anxiety disorders ranges approximately from 7% to 38%, and the prevalence of depressive disorders ranges approximately from 8% to 20% (Chen et al., 2014). Adolescents who suffer from anxiety or depression will likely experience multiple adverse outcomes, such as academic difficulties (e.g., poor academic performance), school dropout, maladaptive social relations, and higher risk for substance abuse and suicide (Ingul & Nordahl, 2013; Seipp, 2007). In addition, entering junior high school is an important step for many young adolescents in their academic journey (Guo, Tian, & Huebner, 2018). In Mainland China, this

transition occurs in the seventh grade, following six years of the more familiar and secure setting of elementary school. When students enter junior high school, they perceive more pressure to succeed and must adapt to new academic workloads, school expectations, and social relationships (Duchesne, Ratelle, & Roy, 2012). Thus, junior high school students are especially prone to experiencing anxiety and depression. Therefore, it is warranted to pay attention to adolescents' anxiety and depression during this transitional period.

However, Chinese adolescents' internalizing problems have largely been neglected by researchers because Chinese people who are deeply influenced by traditional Chinese culture usually consider individual well-being less important than the welfare of the collective or long-term personal success (Chen & Li, 2000). Therefore, to date, there have been few systematic, empirically-informed prevention or intervention efforts related to internalizing problems among students in Chinese schools. Moreover, the prevalence rates and levels of Chinese adolescents' anxiety and depression have been increasing in the past decades, likely as the result of facing the many rapid and dramatic social changes in China, such as economic and education reforms as well as changes in family structure (Zheng, Rijdsdijk, Pingault, McMahon, & Unger, 2016). Therefore, it is important to understand the determinants and the

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specific psychological mechanisms accounting for the development of adolescents' anxiety and depression in China, in order to promote healthy outcomes as early as possible.

Some important determinants likely exist in the family context, since the family is one of the most important contexts for the developmental of adolescents' mental health outcomes (Tian & Li, 2005). In early adolescence, individuals develop two conflicting tendencies of independence and attachment with parents. On the one hand, adolescents seek increasing autonomy from their parents. On the other hand, adolescents still benefit from a secure attachment to their parents as they are not yet sufficiently mature to deal with the challenges in their life without some support (Xu, Fang, Zhang, Lin, & Zhang, 2008). These two conflicting tendencies result in unique challenges in the interactions between parents and children (Xu et al., 2008), and thus children's psychological problems are often related to the quality of their family functioning. Family dysfunction (e.g., poor problem-solving strategies, ineffective communications among family members) means that a family system does not facilitate appropriate functioning (Mousavi, 2004). According to previous research, higher levels of family dysfunction are closely related to higher levels of anxiety and depression in adolescents (Xie, Xie, Zhang, & Zhang, 2008). However, previous research has mainly focused on the direct effects of family dysfunction, with few attempts to elucidate the psychological mechanisms that account for the association between family dysfunction and adolescents' anxiety and depression.

The overarching purpose of our study was thus to reveal the psychological mechanisms linking family dysfunction and adolescents' anxiety and depression. Social-cognitive models highlight the cognitive pathways between social contexts and individuals' developmental outcomes (Wood, Maltby, Stewart, Linley, & Joseph, 2008). Previous literature has suggested that the family system not only relates to the formulation of individuals' self-concepts, but it may also relate to interpersonal interactions (Ferro & Boyle, 2015; Wu & Chow, 2013). Therefore, family dysfunction could be linked with individual differences in psychopathology (e.g., anxiety and depression) via adolescents' feelings about themselves (i.e., self-esteem) and their interpersonal relationships (i.e., loneliness). Given that it is possible to ignore the correlations among mediating variables by testing each mediating variable separately (Kong et al., 2012), we examined the mediation effects of *both* self-esteem and loneliness simultaneously in the relations between family dysfunction and anxiety and depression in adolescents. Overall, we evaluated a multiple mediating model following a social-cognitive theoretical framework: social context (i.e., family dysfunction) → perceptions of self (i.e., self-esteem) and perceptions of interpersonal relationship with parents and peers (i.e., loneliness) → psychopathology outcomes (i.e., anxiety and depression) among Chinese adolescents. Furthermore, we employed a longitudinal design to provide a relatively stringent test of the model.

Family dysfunction and Chinese adolescents' anxiety and depression

The McMaster Model of Family Functioning (MMFF) postulates that a positive family environment is necessary for the healthy development of the physical, psychological, and social functioning of its family members (Epstein, Bishop, & Levin, 1978). The MMFF proposes that the family system is comprised of six key dimensions of functioning (Epstein, Baldwin, & Bishop, 1983): Problem Solving (the family's ability to resolve problems), Communication (how family members exchange verbal information), Roles (the clarity and appropriateness of the allocation of family roles), Affective Responsiveness (the extent to which family members experience appropriate affect over a range of stimuli), Affective Involvement (the extent to which family members are interested in and value each other's activities and concerns), and Behavior Control (how family members express and maintain standards of behavior). Family dysfunction, the evaluation of the functioning of the total family system, refers to a family system that does not facilitate

appropriate functioning in one or more of the aforementioned six dimensions (Mousavi, 2004). Given that family dysfunction might be an important determinant of anxiety and depression based on MMFF, we chose it as the construct of interest for this study.

Focusing on family dysfunction is of special importance for designing interventions for adolescents' anxiety and depression. First, the family is a crucial setting for individual development (Thariq, 2018), especially for junior high school students who are experiencing developmental changes and higher academic expectations and loads. Second, family dysfunction reflects a systemic perspective that considers the family as a whole, which is greater than the sum of its parts (Xu et al., 2008). Third, family dysfunction is amenable to intervention, and can be detected early and influenced by parents (Sandler, Schoenfelder, Wolchik, & MacKinnon, 2011). In addition, most parents have an inherent motivation to take preventive actions concerning the development of their children (Yap, Pilkington, Ryan, & Jorm, 2014). Therefore, we focused on family dysfunction as a predictor of young adolescents' anxiety and depression based on its likely critical importance for intervention.

Previous research has demonstrated that family dysfunction is related to adolescent psychopathology (Chapman & Woodruff-Borden, 2009; Ferro & Boyle, 2015). According to family function theory (Miller, Ryan, Keitner, Bishop, & Epstein, 2000), the overall family environment is associated with the formation of anxiety and depression. Some studies have revealed that higher levels of family dysfunction represent a risk factor for the development of higher levels of anxiety (Katz & Low, 2004) and depression (Martin, Rozanes, Pearce, & Allison, 2010). For instance, Weeks et al. (2014) found that family dysfunction at age 8–9 increased the possibility of severe internalizing symptoms (i.e., anxiety and depression) at age 12–13 with a sample of 4405 Canadian children. Pagani, Japel, Vaillancourt, Côté, and Tremblay (2008) indicated that a prolonged duration of high levels of family dysfunction was associated with the most extreme developmental trajectories of anxious behavior (i.e., a higher base level at age 2 and steady increments over time to age 11) in another large Canadian sample. Therefore, it seems plausible that family dysfunction would also operate as an important determinant of Chinese adolescents' anxiety and depression.

Although family dysfunction has been linked with adolescents' anxiety and depression, few studies have explored the possible mediation effects for these associations. Mediation refers to the “transmission” of the effect of an explanatory variable on an outcome variable through an intermediate variable termed the mediator (Mackinnon, Fairchild, & Fritz, 2007). The current mediation literature discusses two different types of mediation (Nitzl, Roldan, & Cepeda, 2016): full mediation (i.e., only the indirect path is statistically significant) and partial mediation (both the direct and indirect paths are statistically significant). The mediation model may potentially explicate the specific psychological mechanism or mechanisms that underlie the association between an antecedent variable and outcomes via the inclusion of mediating factors (Mackinnon et al., 2007). Exploring such mechanisms could answer the question of how family dysfunction is translated into adolescents' anxiety and depression. Based on a social-cognitive model, which integrates social situations, mediating cognitive mechanisms, and individual differences (Wood et al., 2008), our study focused on adolescents' perceptions about themselves (i.e., self-esteem) and interpersonal relationships with parents and peers (i.e., loneliness) as key cognitive mediators linking family dysfunction and mental health outcomes among Chinese adolescents.

The mediating roles of self-esteem and loneliness

Self-esteem

Self-esteem, defined as a global positive or negative view of the self (Rosenberg, 1965), is one aspect of an individual's self-concept. It emerges from individuals' interactions with society, family members,

and other people, such as teachers and peers (Baumeister & Bushman, 2010; Rosenberg, 1965). The family environment represents the earliest and most proximal environmental context for children (Harter, 2012), and family functioning is highly related to children's self-esteem. Individuals develop perceptions of self-worth through participating in problem solving, communicating with parents, and incorporating family roles, all of which are important aspects of family functioning (Ferro & Boyle, 2015). Additionally, adolescents' self-esteem increases when they experience their parents' acceptance and emotional support, and such acceptance and emotional support reflect the aspects of affective responsiveness and affective involvement in family functioning (Yen, Yang, Wu, & Cheng, 2013). Therefore, family dysfunction was expected to be an important determinant of children's self-esteem. Empirical research has also supported this relation. For example, using a sample of 816 children aged between 7 and 16, Wu et al. (2015) revealed that family dysfunction was associated with low self-esteem.

In addition, low self-esteem is an important predictor of subsequent psychopathology (Arslan, 2016). According to the vulnerability model, low self-esteem contributes to anxiety and depression (Sowislo & Orth, 2013). The underlying assumption of the vulnerability model is that self-esteem, like other personality traits, is a diathesis exerting causal influences on the onset and maintenance of psychopathology (Orth, Robins, & Roberts, 2008). For depression, low self-esteem contributes to the processes of reassurance seeking, negative feedback seeking, and rumination, which are theoretically linked to depression (Sowislo & Orth, 2013). For anxiety, as suggested by terror management theory, high self-esteem alleviates anxiety elicited by awareness of human mortality (Pyszczynski, Greenberg, Solomon, Arndt, & Schimel, 2004). In addition, terror management theory postulates that all anxiety is ultimately derived from, and related to, the fear of death (Pyszczynski et al., 2004). Therefore, high self-esteem might be associated with the mitigation of all anxiety. Many empirical studies using longitudinal designs have shown a substantial negative relation between self-esteem and individuals' depression (see Sowislo & Orth, 2013, for a review). For instance, using a large longitudinal data set with four repeated assessments, Orth et al. (2008) found that low self-esteem operated as a risk factor for depression. Furthermore, a meta-analysis of longitudinal studies demonstrated that low self-esteem also predicted anxiety (Sowislo & Orth, 2013).

In addition to the empirical support for the separate parts of the mediating paths (i.e., from family dysfunction to self-esteem and from self-esteem to anxiety and depression), a few studies have evaluated the mediating roles of self-esteem between similar social contexts and psychological outcomes. For instance, Yen et al. (2013) found that poor family functioning was related to low self-esteem among Chinese adolescents, and that lower levels of self-esteem were related to higher levels of social anxiety. Also, Hu and Ai (2016) observed that self-esteem partially mediated the link between parent-adolescent relationships and depression in Chinese junior high school students. Finally, using latent growth curve modeling, Ferro and Boyle (2015) found that self-esteem partially mediated the path from family functioning to children's anxiety and depression in Canadian children of ages 10 to 15 years. Overall, children who live in higher levels of dysfunctional families are more likely to report lower self-esteem, and in turn are inclined to experience higher levels of depression and anxiety.

Loneliness

Loneliness is defined as feelings and thoughts of being isolated and disconnected from others (Russell, Salazar, & Negrete, 2000). Loneliness can occur in all periods of development, but it is experienced most intensely during adolescence (Antognoli-Toland, 2001). Family function theory posits that the quality of the family environment is associated with the formation of loneliness (Miller et al., 2000). Specifically, loneliness is associated with dysfunctional family experiences because adolescents' needs for intimacy or close relationships cannot be

met in such a family environment (Wu & Chow, 2013). Moreover, when adolescents are over-controlled and misunderstood by their parents, adolescents often report feeling lonely (Frisén, 2007). In addition, in dysfunctional families, adolescents likely experience fewer positive social interactions to observe and model, so they are less able to develop effective and lasting relationships with peers (NICHD Early Child Care Research Network, 2009). Given that peer relationships serve as social capital and are highly influential during this developmental stage (Farrell, Thompson, & Mehari, 2017), a perceived lack of intimate peer relationships would especially increase adolescents' feeling of loneliness.

Adolescents with higher levels of loneliness are more likely to experience anxiety and depression. Despite the overlap in common features of loneliness and depression, they appear to be distinct phenomena (Heinrich & Gullone, 2006). Loneliness is more prevalent than depression (Erzen & Çikrikci, 2018). It is a universal experience, which can occur in differing degrees between individuals and within individuals at differing stages in their lives. Moreover, loneliness involves a specific appraisal of the social domain in one's life, whereas depression involves appraisals that are more global and heterogeneous, covering multiple life domains (Heinrich & Gullone, 2006). Lonely individuals report beliefs, such as, "I have no one to talk with." and "I feel that others do not pay attention to me." These beliefs, which often reflect cognitive errors, may yield a sense of depression and even suicidal thoughts (Pössel, 2017). Lonely adolescents display a fear of negative evaluations because they believe that nobody likes them, which may increase their anxiety. Empirical investigations have linked loneliness to anxiety and depression (see Michalska da Rocha, Rhodes, Vasilopoulou, & Hutton, 2017 for a review). For example, research on left-behind children in China (i.e., rural children left at home when one or both of their parents migrate to urban areas for work), has also shown that the frequent experience of loneliness is significantly related to their levels of anxiety and depression (Yuan, Jin, & Yang, 2014). In a longitudinal study with a sample of 296 British children, Qualter, Brown, Munn, and Rotenberg (2010) established prospective links between loneliness and depression over an 8-year period from early/middle childhood to adolescence.

A few studies have evaluated the mediating roles of loneliness between social contexts and psychological outcomes. For instance, using a cross-sectional design, He, Zhou, Li, Cao, and Guan (2014) found that loneliness played a partial mediating role between social support and depression in a sample of students displaying internet addictions. Overall, individuals from dysfunctional families appear less likely to feel understood or supported in their interpersonal interactions with family members and peers, and are in turn more inclined to report higher levels of anxiety and depression.

Self-esteem and loneliness are the two focal mediators in this study. They are distinguishable, but interrelated for several reasons. First, adolescents with low self-esteem are more likely to experience feelings of alienation and detachment because of their beliefs that they are not worthy of love (Nayak & Kochar, 2016). Several studies have verified the path from self-esteem to loneliness (e.g., Kong & You, 2013; Liu, Shen, Xu, & Gao, 2013). Second, adolescents with feeling of loneliness may attribute the cause of their loneliness to "not being good enough" (Nayak & Kochar, 2016). Some studies have verified the path from loneliness to self-esteem (e.g., Yildiz, 2017). Third, both self-esteem and loneliness might be associated with another predictor (Nayak & Kochar, 2016). For instance, Nayak and Kochar (2016) found in a sample of undergraduate students that both self-esteem and loneliness were predicted by parenting style. Therefore, given that loneliness and self-esteem are both possible mediators and they are interrelated, it seems necessary to consider the mediating roles of loneliness and self-esteem simultaneously, thus controlling for the correlation between loneliness and self-esteem.

Gender differences

Gender differences have been documented in the levels of anxiety and depression among adolescents (Nivard et al., 2015). Compared to boys, girls are more likely to experience higher levels of anxiety and depression (Nivard et al., 2015), and lower levels of self-esteem in adolescence (Bleidorn et al., 2016). In addition, gender differences might also moderate the links between variables. For instance, the association between family functioning and loneliness was significant only for girls (Shi, Wang, & Zou, 2017); the associations between loneliness and anxiety/depression appeared stronger among women than men (Chang, 2018); and the association between self-esteem and depression was stronger for girls than for boys (Moksnes & Espnes, 2012). A possible explanation for such findings might be that girls display a stronger interpersonal orientation and are more sensitive to relationships (Shi et al., 2017). However, the association between some variables did not differ as a function of gender. Specifically, family functioning was a very strong predictor of self-esteem for both genders (Mandara & Murray, 2000), and the associations between self-esteem and anxiety also did not differ for genders (Moksnes & Espnes, 2012). Considering the possible gender differences in some associations, we tested for gender differences in the multiple mediation model to see whether the overall pattern of effects differed for boys and girls.

Covariates

Beyond gender, there were other demographic variables that potentially related to our study variables. Specifically, age and SES (i.e., father's and mother's work status and education level) have been revealed to be associated with family dysfunction, loneliness, self-esteem, anxiety, and depression (e.g., Martin et al., 2010; Nayak & Kochhar, 2016; Sowislo & Orth, 2013). Therefore, these demographic variables (i.e., gender, age, and SES) were treated as covariates in our study.

The current study

Overall, based on the MMFF, higher levels of family dysfunction would be related to higher levels of anxiety and depression among adolescents. Furthermore, based on a social-cognitive model, students' perceptions of high loneliness and low self-esteem might account for these associations. However, few studies have evaluated the direct effects of family dysfunction on adolescents' anxiety/depression or the multiple mediating roles of self-esteem and loneliness using longitudinal designs, limiting the confidence in the existing results about the associations.

Therefore, we aimed to examine a multiple mediation model in which loneliness and self-esteem were hypothesized to mediate the relations between family dysfunction and Chinese adolescents' anxiety and depression using a three-wave longitudinal design. In addition, given that gender might moderate some associations in such a multiple mediation model, we also aimed to examine gender differences in the mediation model as a supplementary analysis. The multiple mediation model is a conservative statistical approach for testing the full model, because it allows evaluation of the indirect effect of a specific mediator in the presence of other mediators, and can reduce the likelihood of parameter bias due to omitted variables (Preacher & Hayes, 2008). In addition, compared with a simple mediation model, the multiple mediation model allows for simultaneous examinations of multiple psychological mechanisms, illuminating complementary indirect paths, and clarifying the complex interplay among the variables that promote the development of anxiety and depression.

Specifically, we formulated the following specific hypotheses (see Fig. 1): (1) Higher levels of family dysfunction at Time 1 will predict Chinese adolescents' anxiety and depression at Time 3. (2) Self-esteem and loneliness at Time 2 will simultaneously mediate the relations between family dysfunction at Time 1 and Chinese adolescents' anxiety

and depression at Time 3. (3) As for the supplementary analysis, based on the previous literature, we hypothesized that the various associations would be stronger for girls than for boys.

Method

Participants

The participants were recruited from two public junior high schools located in a city in northern China. These schools were typical of most junior high schools in China. In every school, eight classes from Grade 7 (i.e., the first year of junior high school in China) were invited to participate. A total of 921 students (51.7% girls) completed the Time 1 (T1) baseline questionnaires. For the students who were present on the day of assessment, the overall response rate was close to 99%. The mean age of the participants at T1 was 12.98 years ($SD = 0.66$), ranging from 12 to 15 years. Almost all of the participants' parents had achieved a junior high school degree or higher. At the Time 2 (T2) assessment six months later, 816 adolescents were retained from the T1 sample. The original T1 sample was still enrolled in Grade 7 at Time 2. At the Time 3 (T3) assessment, six months after T2, 730 adolescents were retained from the T1 sample. The original T1 sample were enrolled in Grade 8 at T3. The participants' retention rates were 88.59% and 79.26% for the second and third waves respectively.

In total, 730 participants provided data for all three time points. The possible reasons for attrition were that the students transferred to other schools or the students were absent from school on the day of the assessment. Differences in demographic variables and study variables were examined among students having complete data (Group 1), and students having missing data (Group 2). There were no statistically significant differences for gender, age, or the other demographic variables between Group 1 and Group 2. There were also no significant differences on T1 family dysfunction, T1 self-esteem, T1 anxiety, and T1 depression between Group 1 and Group 2. Youth with complete data reported lower levels of loneliness than youth with partial data, however the effect was small ($\eta^2 = 0.01$). Little's MCAR test indicated that the data were likely missing at random (Little, 1988), Little's MCAR $\chi^2(180) = 202.55, p = .12$. Therefore, we applied full Information Maximum Likelihood (FIML) estimation for our estimations (Peng, Harwell, Liou, & Ehman, 2006).

Procedures

The Human Research Ethics Committee of South China Normal University and the related boards of the university provided approval for the study. Parents received letters providing information about the study, along with consent forms. Only those students who provided assent along with parental consent were allowed to take part in the study. Graduate assistants administered the set of self-report measures with the "pencil and paper" method. The measures had been translated and back-translated to make sure that the items of the Chinese version corresponded exactly to the items of the original version. Students were informed of the general nature of the study and promised that their responses would be treated confidentially.

Measures

Mean scores were calculated with reverse coding of relevant items, and higher scores reflected higher levels of study variables (i.e., family dysfunction, self-esteem, loneliness, anxiety, and depression). We used mean scores in preliminary analyses that provided initial information about the data, such as the distributions of the variables. However, given that latent variable strategies could control for measurement error (Williams & O'Boyle Jr, 2008), we used latent scores in SEM for the model test. We thusly conducted a Confirmatory Factor Analysis (CFA) to test the structures of the scales. For the scales measured twice

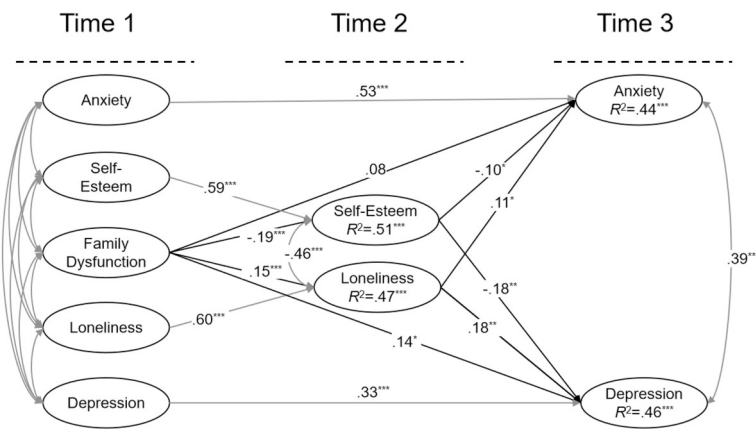


Fig. 1. The multiple mediating model ($N = 921$).

Note. Although covariates were controlled for every study variable, the paths are not shown for conciseness. * $p < .05$, ** $p < .01$, *** $p < .001$.

(i.e., self-esteem, loneliness, anxiety, and depression), a longitudinal configural invariance model (i.e., the pattern of indicator-to-construct relations is expected to be the same on each occasion) was constructed in CFAs, assessing whether the same factor structure provided a good fit across the two occasions (Little, Preacher, Selig, & Card, 2007).

Family dysfunction

The General Function subscale of the Family Assessment Device (FAD; Epstein et al., 1983), which is based on the MMFF, was used to measure family dysfunction at T1. Many studies have provided evidence for the psychometric properties of the FAD with adolescents and adults (Juliusdottir & Olafssdottir, 2015; Miller et al., 2000). The FAD has displayed acceptable reliability and validity in children over 12 years old (Cronbach's $\alpha > 0.70$; Su & Duan, 2008). The General Function subscale includes 12 self-report items (e.g., "We avoid discussing our fears and concerns."; "We can express feelings to each other."; "Planning family activities is difficult because we misunderstand each other."). The response options incorporated a 4-point Likert scale, which ranged from 1 (*strongly agree*) to 4 (*strongly disagree*). With our sample, the Cronbach's α coefficient was 0.74 at Time 1. The results of the CFA showed acceptable fit indices, indicating support for its expected one-factor structure, $\chi^2(43) = 207.45$, $p < .001$, $\chi^2/df = 4.82$, CFI = 0.92, SRMR = 0.05, RMSEA = 0.06, 90% C.I. [0.06, 0.07].

Self-esteem

Self-esteem was measured using the Chinese Version of the Rosenberg Self-Esteem Scale (CVRSES; Rosenberg, 1965; Wang, Wang, & Ma, 1999) at T1 and T2. The Chinese version of the RSES has demonstrated acceptable reliability and validity with Chinese students (Cronbach's $\alpha = 0.77$; Wang et al., 2016). The CVRSES includes 10 self-report items (e.g., "I feel that I'm a person of worth, at least on an equal plane with others."; "On the whole, I am satisfied with myself."; "I feel I do not have much to be proud of."). The response options incorporated a standard 4-point Likert scale, which ranged from 1 (*strongly disagree*) to 4 (*strongly agree*). With our sample, the Cronbach's α coefficients were 0.80 and 0.82 at T1 and T2 respectively. The CFA for longitudinal configural invariance was constructed for T1 and T2 self-esteem, and the model showed acceptable fit, $\chi^2(159) = 627.40$, $p < .001$, $\chi^2/df = 3.95$, CFI = 0.95, SRMR = 0.07, RMSEA = 0.06, 90% C.I. [0.06, 0.07].

Loneliness

Loneliness was measured using the Revised UCLA Loneliness Scale (R-UCLA; Russell, Peplau, & Cutrona, 1980) at T1 and T2. The R-UCLA has shown acceptable reliability and validity with Chinese adolescents (Cronbach's $\alpha = 0.94$; Xu et al., 2011). The scale includes 20 self-report

items (e.g., "I feel isolated from others."; "I lack companionship."; "I feel left out."). The response options included a 4-point Likert scale, which ranged from 1 (*never*) to 4 (*often*). With our sample, the Cronbach's α coefficients were 0.88 and 0.82 at T1 and T2 respectively. A CFA for longitudinal configural invariance was constructed for T1 and T2 loneliness, and the model showed acceptable fit, indicating support for its expected one-factor structure, $\chi^2(719) = 1930.39$, $p < .001$, $\chi^2/df = 2.68$, CFI = 0.90, SRMR = 0.05, RMSEA = 0.04, 90% C.I. [0.04, 0.05].

Anxiety

Anxiety was measured using the Scale for Child Anxiety Related Emotional Disorders (SCARED; Birmaher et al., 1997; Su, Wang, Fan, Su, & Gao, 2008) at T1 and T3. The SCARED has displayed acceptable reliability and validity with Chinese adolescents (Cronbach's $\alpha = 0.89$; Zhou et al., 2014). The SCARED consists of 41 self-report items (e.g., "When afraid, I have difficulty in breathing."; "I am nervous."; "I don't like being away from family."), with five subscales (i.e., Somatic/panic, General anxiety, Separation anxiety, Social phobia, and School phobia). The response options used a 3-point Likert scale, which ranged from 0 (*never*) to 2 (*often*). In our sample, the Cronbach's α coefficients were 0.94 and 0.95 at T1 and T3 respectively. The CFA for longitudinal configural invariance was constructed for T1 and T3 anxiety, and the model showed acceptable fit, indicating support for its expected five-factor structure, $\chi^2(3152) = 6186.30$, $p < .001$, $\chi^2/df = 1.96$, CFI = 0.90, SRMR = 0.04, RMSEA = 0.03, 90% C.I. [0.03, 0.04].

Depression

Depression was measured by The Depression Self-Rating Scale for Children (DSRSC; Birlleson, 1981). The Chinese version was adapted by Su et al. (Su, Wang, Zhu, Luo, & Yang, 2003), and has displayed acceptable reliability and validity with Chinese adolescents (Cronbach's $\alpha = 0.81$; Fan, Zhou, & Liu, 2017). The DSRSC consists of 18 self-report items (e.g., "I don't think life is interesting."; "I feel like crying."; "I think life isn't worth living."). Participants responded using a 3-point Likert scale ranging from 0 (*never*) to 2 (*often*). In our sample, the Cronbach's α coefficients were 0.82 and 0.85 at Time 1 and Time 3 respectively. The CFA for longitudinal configural invariance was constructed for T1 and T3 depression, and the model showed acceptable fit, $\chi^2(575) = 1412.36$, $p < .001$, $\chi^2/df = 2.46$, CFI = 0.90, SRMR = 0.07, RMSEA = 0.04, 90% C.I. [0.04, 0.05].

Covariates

Several demographic covariates were reported by the students at T1, including students' gender (0 = *girl*; 1 = *boy*); age; father's and mother's work status (0 = *have no stable work*; 1 = *have stable work*); father's and mother's education level respectively. The education level

was reported on a scale from 1 to 8 (1 = *never attended school*, 2 = *elementary school*, 3 = *junior high school*, 4 = *senior high school*, 5 = *junior college*, 6 = *bachelor's degree*, 7 = *master's degree*, 8 = *doctoral degree*). Parental work status and education level are the most commonly used SES components (Sirin, 2005). All of these variables were controlled for every major study variable in subsequent analyses.

Data analysis

Preliminary analyses were conducted first to examine the normative distribution of each variable, the correlations among study variables, and the correlations among the covariates and study variables. SPSS 23.0 was employed for these analyses.

Next, we employed structural equation modeling (SEM), conducted in Mplus 7.4 (Muthén & Muthén, 1998-2013), to evaluate the multiple mediation model. Before testing the structural model, we evaluated the measurement model. By testing the measurement model first, we evaluated to what degree each of the latent variable was denoted by its indicators. Employing an item-to-construct balance approach (i.e., successively assigning the highest and lowest loading items across parcels), we constructed three parcels for family dysfunction, four parcels for loneliness, three parcels for self-esteem, and three parcels for depression. Compared with item scores, models based on parcels show advantages in psychometrics (e.g., higher reliability, greater communality, lower likelihood of distributional violations) and model estimation (e.g., reduced sampling error and likelihood of correlated residuals and dual loadings; Little, Rhemtulla, Gibson, & Schoemann, 2013). Then, we examined the structural model based on the measurement model to evaluate the multiple mediating roles of loneliness and self-esteem in the relations between family dysfunction and adolescents' anxiety and depression (see Fig. 1). Bias-corrected bootstrapping, based on 5000 samples, was used to examine the significance of indirect effects, with the purpose of generating bias-corrected confidence intervals (MacKinnon, 2008). The indirect effect was statistically significant at the 0.05 level under the condition that the 95% confidence interval for the indirect effect excluded zero (Shrout & Bolger, 2002). Finally, we used multi-group analysis to examine the moderating role of gender, that is, whether the hypothesized model differed between girls and boys.

The model fit was evaluated using the χ^2/df ratio, the Comparative Fit Index (CFI), Standardized Root Mean Square Residual (SRMR), and the Root Mean Square Error of Approximation (RMSEA). Good model fit was represented as $\chi^2/df \leq 3$, CFI ≥ 0.95 , SRMR ≤ 0.05 , and RMSEA ≤ 0.05 ; and acceptable fit was represented as $\chi^2/df \leq 5$, CFI ≥ 0.90 , SRMR ≤ 0.08 , and RMSEA ≤ 0.08 (Kline, 2005; Little, 2013).

Results

Preliminary analyses

To provide initial support for the model constructs, we conducted descriptive statistics and correlational analyses as preliminary analyses (see Table 1). We regarded the univariate skewness of 2.0 and higher and kurtosis of 7.0 and higher as indicators of non-normality (Curran, West, & Finch, 1996). The values of all variables in this study were below these levels. Correlation analyses are also presented in Table 1. Specifically, the relations among T1 family dysfunction, T1 and T2 loneliness, T1 and T2 self-esteem, T1 and T3 anxiety, and T1 and T3 depression were all statistically significant ($p < .001$). As Table 1 indicates, T1 family dysfunction was positively related with T3 anxiety and T3 depression for young adolescents. Meanwhile, T1 family dysfunction was positively related with T2 loneliness; T1 family dysfunction negatively correlated with T2 self-esteem. Moreover, T2 loneliness positively correlated with T3 anxiety and T3 depression; T2 self-esteem negatively correlated with T3 anxiety and T3 depression. In summary,

all the data distributions were normal and the patterns of correlations were consistent with our expectations, providing support for the hypothesized multiple mediation model.

The multiple mediation model

The measurement models

To examine whether the latent factors were well represented by their respective indicators, we evaluated the measurement model. The measurement model included nine latent factors (T1 family dysfunction, T1 and T2 loneliness, T1 and T2 self-esteem, T1 and T3 anxiety, T1 and T3 depression) and 33 observed variables. The parameters of the loadings of the indicators were assessed for invariance across time to ensure that the fundamental meanings of the latent constructs of these variables (i.e., self-esteem, loneliness, anxiety, and depression) did not change across time, which is the minimum requirement for examining covariance relations (Little et al., 2007). The measurement model revealed a very satisfactory fit to the data, $\chi^2(457) = 1070.60$, $p < .001$, $\chi^2/df = 2.34$, CFI = 0.96, SRMR = 0.04, RMSEA = 0.04, 90% C.I. [0.03, 0.04]. Table 2 shows the components of the latent variables; the loadings on every standardized factor were large ($\lambda > 0.60$). The loadings of measured variables on the latent variables were all statistically significant ($p < .001$), showing that all the latent factors were well represented by their respective indicators. It should be noted that the unstandardized coefficients of the loadings were constrained to be equal across time; however, the standardized coefficients remained different due to the standardization procedure. In summary, the good fit of the measurement model provided support for the subsequent examination of the structural model.

The structural models

The main aim of this study was to examine a multiple mediation model in which loneliness and self-esteem mediated the relations between family dysfunction and adolescents' anxiety and depression. To evaluate the mediating roles of loneliness and self-esteem, we tested a multiple mediation model including all the paths from T1 family dysfunction to T3 anxiety and T3 depression via T2 loneliness and T2 self-esteem (see Fig. 1). All paths from covariates to the study variables were also included in the multiple mediation model. The model revealed a satisfactory fit to the data, $\chi^2(613) = 1264.37$, $p < .001$, $\chi^2/df = 2.06$, CFI = 0.96, SRMR = 0.04, RMSEA = 0.03, 90% C.I. [0.03, 0.04]. After controlling for the covariates, the total effects from T1 family dysfunction to T3 anxiety and T3 depression were significant ($\beta = 0.12$, $p < .01$; $\beta = 0.20$, $p < .01$, respectively), thus hypothesis 1 was supported.

With regard to covariates, boys reported higher levels of family dysfunction ($\beta = 0.08$, $p < .05$). Adolescents with higher father's work status reported lower T1 family dysfunction ($\beta = -0.08$, $p < .05$). Adolescents with higher father's educational level reported higher T1 self-esteem ($\beta = 0.16$, $p < .01$). Other paths for covariates were not statistically significant.

Moreover, higher levels of T1 family dysfunction were associated with higher levels of T2 self-esteem, which in turn associated with lower levels of T3 anxiety and depression; higher levels of T1 family dysfunction were associated with higher levels of T2 loneliness, which in turn were associated with higher levels of T3 anxiety and depression.

Results of bootstrapping showed that the 95% CI for the four indirect effects did not include zero (see Table 3), indicating that all of the indirect effects were statistically significant. Both T2 self-esteem and T2 loneliness mediated the association between T1 family dysfunction and T3 anxiety, and the indirect paths via the two mediators accounted for 15.83% and 13.33% of the total effect from T1 family dysfunction to T3 anxiety respectively. Both T2 self-esteem and T2 loneliness mediated the association between T1 family dysfunction and T3 depression, and the indirect paths via the two mediators accounted for 16.50% and 13.50% of the total effect from T1 family dysfunction to T3 depression

Table 1
Descriptive statistics and correlations for the variables (N = 921).

Variable	M	SD	Skew	Kurt	1	2	3	4	5	6	7	8	9
1. T1 Family Dysfunction	1.94	0.43	0.10	-0.25									
2. T1 Loneliness	2.01	0.50	0.48	-0.01	0.37***								
3. T1 Self-Esteem	2.87	0.45	-0.35	0.53	-0.40***	-0.46***							
4. T1 Anxiety	0.47	0.35	0.95	0.82	0.32***	0.40***	-0.35***						
5. T1 Depression	0.57	0.32	0.47	-0.12	0.52***	0.57***	-0.57***	0.47***					
6. T2 Loneliness	2.03	0.50	0.38	0.17	0.32***	0.61***	-0.40***	0.34***	0.48***				
7. T2 Self-esteem	2.91	0.45	-0.21	0.38	-0.37***	-0.43***	0.62***	-0.31***	-0.50***	-0.56***			
8. T3 Anxiety	0.46	0.35	0.66	-0.23	0.30***	0.29***	-0.33***	0.60***	0.38***	0.36***	-0.35***		
9. T3 Depression	0.63	0.34	0.03	-0.71	0.40***	0.36***	-0.43***	0.32***	0.54***	0.46***	-0.47***	0.46***	
10. Gender	0.48	0.50	0.07	-2.00	0.07*	0.03	-0.03	0.00	0.05	0.00	-0.02	0.02	0.03
11. Age	12.98	0.65	0.37	0.46	0.13***	0.10**	-0.16***	0.04	0.10**	0.05	-0.12***	0.04	0.09*
12. Father's Work Status	0.90	0.30	1.71	5.34	-0.10**	-0.06	0.04	0.00	-0.09**	-0.07	0.10**	0.03	-0.10*
13. Mother's Work Status	0.79	0.40	1.46	0.14	-0.07*	-0.04	0.07*	-0.01	-0.08*	-0.04	0.08*	-0.05	-0.08
14. Father's Education Level	4.38	1.42	0.18	-0.80	-0.11**	-0.09**	0.20***	-0.06	-0.14***	-0.09**	0.16***	-0.06	-0.12**
15. Mother's Education Level	4.35	1.38	0.05	-0.60	-0.11**	-0.08*	0.17***	-0.06	-0.11**	-0.11**	0.18***	-0.05	-0.11**

* $p < .05$.
** $p < .01$.
*** $p < .001$.

Table 2
The measurement model: latent variable factor loadings (N = 921).

Variables	Unstandardized loading	Standardized loading		
		T1	T2	T3
Family Dysfunction				
Family Dysfunction1	1.00***	0.71***		
Family Dysfunction2	0.93***	0.70***		
Family Dysfunction3	1.09***	0.71***		
Loneliness				
Loneliness1	1.00***	0.80***	0.84***	
Loneliness2	0.73***	0.71***	0.76***	
Loneliness3	1.05***	0.82***	0.84***	
Loneliness4	0.84***	0.75***	0.78***	
Self-Esteem				
Self-Esteem1	1.00***	0.85***	0.89***	
Self-Esteem2	0.93***	0.83***	0.87***	
Self-Esteem3	0.62***	0.66***	0.70***	
Anxiety				
Anxiety1	1.00***	0.88***		0.89***
Anxiety2	1.02***	0.86***		0.89***
Anxiety3	0.94***	0.69***		0.67***
Anxiety4	0.99***	0.86***		0.87***
Anxiety5	0.82***	0.68***		0.71***
Depression				
Depression1	1.00***	0.71***		0.77***
Depression2	1.37***	0.74***		0.78***
Depression3	1.33***	0.79***		0.85***

*** $p < .001$.

respectively. In addition, the direct path from T1 family dysfunction to T3 anxiety was not significant, whereas the direct path from T1 family dysfunction to T3 depression was significant. Therefore, there was one direct path and two indirect paths (via T2 self-esteem and T2 loneliness) from T1 family dysfunction to T3 anxiety, and there were only two indirect paths (via T2 loneliness and T2 self-esteem) but no direct path from T1 family dysfunction to T3 depression. Overall, hypothesis 2 was supported. In summary, the mediating roles of both self-esteem and

Table 3
Bootstrap analyses of the magnitude and statistical significance of indirect effects (N = 921).

Indirect pathways	β	SE	p	95% CI
Family Dysfunction (T1) → Self-Esteem (T2) → Anxiety (T3)	0.019	0.009	.046	0.003, 0.043
Family Dysfunction (T1) → Loneliness (T2) → Anxiety (T3)	0.016	0.008	.040	0.002, 0.035
Family Dysfunction (T1) → Self-Esteem (T2) → Depression (T3)	0.033	0.013	.009	0.008, 0.048
Family Dysfunction (T1) → Loneliness (T2) → Depression (T3)	0.027	0.011	.015	0.006, 0.039

loneliness in the associations between family dysfunction and adolescents' anxiety and depression were supported.

As a post-hoc exploratory analysis, we examined facets of anxiety disorder symptoms using the five SCARED subscales. The results indicated that the direct paths from family dysfunction to the five subscales and the mediating roles of self-esteem and loneliness were somewhat different for the five subscales. Specifically, there was only a positive direct path from T1 family dysfunction to T3 somatic/panic anxiety; there was one positive direct path and one positive indirect path (via T2 loneliness) from T1 family dysfunction to T3 general anxiety; there was one positive direct path and one positive indirect path (via T2 self-esteem) from T1 family dysfunction to T3 separation anxiety; there was no direct or indirect path from T1 family dysfunction to T3 social anxiety; and there were two positive indirect paths (via T2 self-esteem and T2 loneliness) from T1 family dysfunction to T3 school phobia. However, although some of the indirect paths were significant and some were not, the magnitudes of the coefficients of most indirect effects did not differ substantially. We provided more detailed information in the supplementary material.

Gender differences

Considering that gender might moderate some associations in aforementioned multiple mediation model, we also aimed to examine moderating role of gender in the model. Multi-group analysis was employed to identify whether the path coefficients differed significantly between boys and girls. A value of ΔCFI smaller than or equal to 0.01 indicated a non-significant difference (Cheung & Rensvold, 2002). We compared two models: The model allowing the structural paths to vary across gender and the model constraining the structural paths to be equal across gender. In these two models, all of the factor loadings, error variances, and structural covariances were controlled to be equal in both models, and students' age, father's and mother's work status and education level were controlled as covariates for all variables. The results suggested that the path coefficients did not differ for boys and girls ($\Delta CFI = 0.001$). Thus, the hypothesis for the supplementary analysis that the various associations would be stronger for girls than for boys

was not supported.

Discussion

The MMFF theory postulated significant, positive relations between family dysfunction and individuals' anxiety and depression (Epstein et al., 1978), and these relations have garnered considerable empirical support (Xu et al., 2008). However, these previous findings have been based mainly on cross-sectional designs, which limit the nature of the inferences that can be derived from the data. Furthermore, questions regarding the underlying psychological mechanisms that account for these relations have remained largely unanswered. Based on a social-cognitive model (Wood et al., 2008), we constructed a multiple mediation model to evaluate the roles of the cognitive variables of self-esteem and loneliness in accounting for the association between family dysfunction and Chinese adolescents' anxiety and depression. The results supported a model in which family dysfunction was related to subsequent higher levels of adolescents' anxiety and depression via both lower self-esteem and higher loneliness simultaneously.

Several contributions of our study to the literature should be highlighted. First, the present study enriched the understanding of the underlying psychological mechanisms accounting for the associations between family dysfunction and adolescents' anxiety and depression. Opening up this "black box" yielded crucial implications for assessments and interventions designed to address adolescents' anxiety and depression. Second, we obtained support for the multiple mediation model using a three-wave longitudinal design, increasing the confidence in our conclusions regarding the nature and sequence of the relations among the study variables. Third, we examined the multiple mediation model among Chinese adolescents experiencing the critical transition involving junior high school, helping to elucidate the development of psychopathology during this special period.

Family dysfunction and Adolescents' anxiety and depression

Consistent with Hypothesis 1, family dysfunction demonstrated a significant, positive relation with anxiety and depression. This finding is in accordance with previous research with adolescents (e.g., Bögels & Brechman-Toussaint, 2006). Families high in dysfunction usually display lower ability to communicate with one another and to solve problems (Clarke & Critchley, 2016). Therefore, students experiencing higher levels of family dysfunction would face more problems in their families, increasing their mental burden, and in turn increasing the possibility of the development of psychological symptoms (Clarke & Critchley, 2016). Meanwhile, as mentioned before, adolescents in this transitional period experience many novel challenges (Guo et al., 2018). However, adolescents in dysfunctional families are less able to communicate their emotions and thoughts effectively with their parents, which likely further hinders their ability to obtain sufficient supports from their family members when needed, thus leading to the development of anxiety and depression (Kleiboer et al., 2015).

The mediating roles of self-esteem and loneliness

We further examined possible psychological mediators in the relations between family dysfunction and adolescents' anxiety and depression. Consistent with Hypothesis 2, family dysfunction was significantly related to young adolescents' anxiety and depression through the multiple mediators of self-esteem and loneliness. Specifically, family dysfunction showed indirect effects on anxiety and depression via loneliness and self-esteem respectively.

On the one hand, self-esteem mediated the relation between family dysfunction and young adolescents' anxiety and depression. The quality of the family environment thus appears to provide a major contribution to the formulation of the adolescents' sense of self-esteem. Individuals in families with lower levels of dysfunction would confront fewer

problem in the family and be able to express their thoughts and emotions more freely and effectively (Clarke & Critchley, 2016), yielding less frustration and the experience of higher self-worth. Moreover, adolescents' levels of self-esteem predicted their subsequent levels of anxiety and depression. This relation was consistent with previous research showing that low self-esteem displays a substantial relation to individual's anxiety and depression (see Sowislo & Orth, 2013, for a review). For example, Krug, Wittchen, Lieb, Beesdo-Baum, and Knappe (2016) showed that lower levels of anxiety could be predicted by self-esteem. The relation between self-esteem on anxiety and depression in our study was thus consistent with the vulnerability model, which theorizes that low self-esteem contributes to depression and anxiety. There are several possible reasons for these associations. For example, adolescents with low self-esteem may seek negative feedback from the environment to verify their negative self-concept, which may lead to increases in anxiety and depression (Sowislo & Orth, 2013). Adolescents with low self-esteem may also be more likely to ruminate about negative aspects of the self, which in turn increases anxiety and depression (Kuster, Orth, & Meier, 2012; Sowislo & Orth, 2013).

On the other hand, the adolescents in our study who reported higher levels of family dysfunction were prone to be lonelier, which in turn predicted higher levels of anxiety and depression. Social psychologists emphasize that people have an innate need to experience positive relationships with others (Michalska da Rocha et al., 2017). When a person's network of social relationships is significantly deficient in either quality or quantity, loneliness may occur (Terrell-Deutsch, 1999). In dysfunctional families, adolescents may display poor communication skills and often feel that they are misunderstood (Shi et al., 2017), which increases their feelings of loneliness. In addition, adolescents in such families may fail to form positive expectations about interpersonal relationships. Thus, they are not well-prepared to develop positive peer relationships (Cooper & Cooper, 2016), impeding their interactions with peers, also resulting in loneliness. Our results are consistent with previous studies showing that family dysfunction relates to greater loneliness (e.g., Coln, Jordan, & Mercer, 2013; Sturge-Apple, Davies, & Cummings, 2010). Our study also demonstrated that higher levels of loneliness in the adolescents predicted higher levels of anxiety and depression. This result is consistent with interpersonal risk models, which focus on depression as a consequence of interpersonal skill deficits and relationship disruption (Rudolph, 2017). In addition, feelings of loneliness may exacerbate individuals' social exclusion, facilitating additional anxiety and depression (Lee & Noh, 2015; Sun, Tong, & Fan, 2017). This association between loneliness and individuals' anxiety and depression might be stronger during adolescence compared to other age groups because adolescents are especially sensitive to the interpersonal context, yet they are less proficient in controlling their emotions (Collins & Steinberg, 2006).

Our study demonstrated the mediating roles of both self-esteem and loneliness in the links between family dysfunction and adolescents' anxiety and depression among Chinese adolescents, even in the presence of one another. Some studies have revealed similar multiple mediating roles of self-esteem and loneliness between social contexts and individuals' mental health. For example, Tian (2014) found that both self-esteem and loneliness partially mediated the effect of intergenerational social support on subjective well-being in a sample of 429 elderly participants. Moreover, from a theoretical perspective, the multiple mediators model reflected the notion of multifinality, in which similar conditions lead to multiple outcomes, and equifinality, wherein many different avenues can lead to the same outcome (McMahon, Grant, Compas, Thurm, & Ey, 2003). Finally, the analyses of the multiple mediation model also supported the notion that anxiety and depression may share similar antecedents as well as mediating processes in their respective causal chains. This finding is consistent with the results of the review of Yap et al. (2014), which concluded that parental factors are not specific to anxiety or depression. Our study thus extended beyond previous studies by revealing that anxiety and

depression not only overlap in terms of their relations with family dysfunction, they also share similar psychological mechanisms though which family dysfunction operates to influence adolescents' mental health outcomes.

As for the residual direct effects from T1 family dysfunction and T3 anxiety and depression, the results showed that after controlling for the mediating effects of self-esteem and loneliness, the path from family dysfunction to anxiety was not significant, whereas the path from family dysfunction to depression remained significant. These results suggested that self-esteem and loneliness are important mediators accounting for the association between family dysfunction and anxiety; however, for depression, besides the mediating roles of self-esteem and loneliness, family dysfunction might still directly lead to depression, or other mediators (e.g., self-criticism) might also be important in the relation between family dysfunction and depression (Baetens et al., 2015).

Gender differences

The results of multi-group analysis showed that the path coefficients did not differ between boys and girls. The results were not consistent with some previous studies that found that the associations were stronger for girls than for boys (e.g., Chang, 2018; Moksnes & Espnes, 2012; Shi et al., 2017). Although these cross-sectional studies supported gender differences, such results were not found in our longitudinal study. Our results were thus consistent with the gender similarities hypothesis (Hyde, 2005), which holds that males and females are similar in many, but not all ways. Thus, the relations and mechanisms demonstrated in our study were important for both boys and girls. However, given the non-significant results, more investigations are needed regarding gender differences in the associations among these variables.

Strengths, limitations, and future direction

The major strength of our study was its multi-wave longitudinal design in examining the multiple mediation model. The longitudinal design enabled us to obtain data from multiple time points and to control for the prior levels of the variables. The collection of data at multiple time points ensured that the antecedent variables occurred before the outcome variables. The intervals between the time points provided sufficient time for the antecedent variables to display their effects. In addition, the controlling of prior levels of the variables ruled out the possibility that prospective effects are simply due to concurrent relations between the variables and the stability of the predicted variables (Sowislo & Orth, 2013).

Some limitation of this study should be underscored. First, self-report scales were used exclusively, which could limit the internal validity of the study. However, given that some variables in our study were related to adolescents' self-perceptions or feelings (i.e., loneliness and self-esteem), self-reports may reflect the most suitable method to collect the data at this age. Nevertheless, future researchers should consider using multiple sources and types of measures to enhance confidence in the findings (e.g., parent reports of family dysfunction). Additionally, other measurement methodologies (e.g., Implicit Associates Test for self-esteem) would also be beneficial for future studies (Heatherton & Wyland, 2003).

Second, families are facing some new challenges nowadays (Thariq, 2018), thus family functioning may be somewhat different than reflected in the MFFF. For instance, the impact of internet exposure and communication technology has changed the pattern of family communication (Thariq, 2018), which might also impact family functioning. Therefore, future research on family dysfunction could consider changes in family functioning when examining the generalizability of our findings.

Third, we formulated the multiple mediation model within the

framework of *social context* → *self-perceptions* → *psychopathology outcomes*. We did not consider the reverse paths because the model would be extraordinarily complex if we had to combine the multiple mediating paths and the reverse paths. However, it should be noted that both processes (e.g., low self-esteem contributing to anxiety or depression versus anxiety or depression eroding self-esteem) are not mutually exclusive (Sowislo & Orth, 2013). Therefore, future research could consider more complete longitudinal designs (e.g., full cross-lagged panel model) to further assess and disentangle possible bidirectional processes.

Fourth, we tested the roles of family dysfunction, self-esteem, and loneliness in the development of adolescents' anxiety and depression; however, this study wasn't meant to be an exhaustive overview of every possible family factor or mediator. For instance, there might other family factors (e.g., family strain; Boone & Kim, 2019) and mediators (e.g., psychological insecurity, peer victimization; Li et al., 2018). These antecedents should also be considered in further studies.

Finally, the sample was composed of young adolescents in China, which may decrease the cross-cultural generalizability of the findings of the current study. For example, compared to the Chinese culture which reflects collectivistic values, individualistic cultures place more emphasis on self-esteem and less emphasis on social relationships (Kong & You, 2013). Therefore, the mediating roles of loneliness and self-esteem in accounting for the relation between family dysfunction and individuals' anxiety and depression might differ in individualistic cultures. Further research should be conducted in different cultures to determine the universality of our findings.

Implications

Despite its limitations, the current three-wave study yielded several practical, albeit tentative, implications for school professionals and parents in understanding and preventing anxiety and depression in Chinese adolescents. First, we found that family dysfunction was significantly associated with adolescents' anxiety and depression. Parents should recognize the role of family dysfunction and make efforts to assess and alleviate it, including improving the family's ability to cope with problems and communicate more effectively (Clarke & Critchley, 2016). School professionals could also pay more attention to strengthening family-school collaborations, especially for students whose families are experiencing problems. Connell and Dishion (2008) indicated that parental engagement in a school program designed to improve parent management practices and parent-adolescent relationships resulted in benefits for youths' depressive symptoms. Therefore, the development and implementation of empirically-validated family-school collaborations might be a particularly efficient and effective way to address Chinese adolescents' anxiety and depression.

Second, we found that family dysfunction indirectly related to young adolescents' anxiety and depression through loneliness. Thus, parents may facilitate their children's mental health through decreasing their loneliness, such as participating in their children's activities appropriately to make them feel cared for and meeting their needs for affiliation and love. Moreover, school professionals could also encourage parents to participate as much as possible in their children's schooling, such as through offering a variety of opportunities for parents to communicate with the school and the children. Higher levels of parental involvement in school could improve parent-child relationships, as well as children's peer relationships (Kirkhaug, Drugli, Klöckner, & Mørch, 2013), decreasing children's feelings of loneliness. In addition, a meta-analysis of interventions to reduce loneliness concluded that the most effective means of reducing loneliness was through cognitive interventions involving helping individuals to replace maladaptive social cognitions with more adaptive ones (Masi, Chen, Hawkey, & Cacioppo, 2011). Specifically, parents and school professionals could directly teach lonely individuals to identify automatic negative thoughts, regard these thoughts as hypotheses to be tested

rather than as facts, and develop more adaptive thoughts (Masi et al., 2011).

Third, we found that self-esteem also mediated the relation between family dysfunction and young adolescents' anxiety and depression. When adolescents confront difficulties, parents and school professionals should assess and address their self-esteem. For example, parents and school professionals could guide adolescents to find their strengths, which may improve their self-esteem (Gillham et al., 2011). Parents and school professionals could also use some therapeutic strategies (e.g., challenging unrealistic self-perceptions) and support strategies (e.g., praise and encouragement) in their interactions with students with low self-esteem (Cabaniss, Cherry, Douglas, & Schwartz, 2011).

Finally, the complete multiple mediating model implied that integrative prevention and intervention programs should target both adolescents' anxiety and depression given that anxiety and depression share similar antecedents and mediating mechanisms. As such, multi-component interventions focusing on the interpersonal context (i.e., family context) as well as the intrapersonal perceptions (i.e., loneliness, and self-esteem) simultaneously may be most powerful.

Acknowledgment

This work was supported by the National Natural Science Foundation of China (NO. 31971005), Humanities Social Sciences Research Planning Foundation from Ministry of Education, 2015 (No. 15YJA190003), the MOE Project of Key Research Institute of Humanities and Social Sciences at Universities, 2016 (No. 16JJD190002), and "13th Five-Year" Plan of Philosophy and Social Science Development in Guangzhou, 2018 (No. 2018GZGJ22).

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.appdev.2019.101090>.

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